CHAPTER 5. SURFACE STORAGE OPTIONS

This chapter summarizes the initial screening of the surface storage options. As described in Chapter 4 (Table 4-4), 16 potential sites were identified early in the study, of which, two would be expanded in the future-without-project condition. Figure 5-1 shows the locations of the remaining 14 sites that were reviewed in the initial screening.

The findings presented in this chapter are based on a preliminary review of the technical feasibility of constructing facilities at the candidate sites. The assessment was conducted at a reconnaissance level of detail, consistent with the scope of Phase 1 of the Investigation. The evaluation team included engineers and geologists that addressed design and construction issues, and environmental specialists that identified the range of likely environmental impacts and gaged at a very preliminary level the potential to mitigate adverse impacts.

Surface storage options that are retained after this initial screening will be further evaluated using hydrologic models to determine the extent to which they could contribute toward meeting the project goals. The initial screening ensures that future Investigation resources are directed only at options that appear reasonable to consider further.

METHODOLOGY

The screening began with a review of previous studies. In some cases, potential facilities described in previously studied were based on different configurations than those considered for this study. In such cases, features that were not relevant to the configuration under review were deleted. Similarly, features necessary for the configuration considered in this study were added. Conceptual engineering plans were developed for sites where no previously developed plans had been developed.

Figures 5-2 and 5-3 provide conceptual representations of major design and construction elements of a surface water storage project that were considered for a reservoir enlargement or construction of a new reservoir, respectively. Institutional and operational issues such as future sponsorship, ownership, operational responsibilities, or the allocation of developed water among potential project purposes has not been considered.

A Technical Memorandum (TM) was prepared for each storage option site. Each TM describes existing facilities, configurations and design characteristics, and relevant engineering and environmental issues. Engineering issues considered include geologic conditions, construction access, potential sources of construction materials, and impacts to existing infrastructure. Environmental issues considered include potential impacts to terrestrial and aquatic vegetation and wildlife, recreational resources, and land uses. Initial screening did not include consultations with environmental, resource, or permitting agencies.

SITE SPECIFIC SURFACE STORAGE OPTIONS

The screening of potential surface storage sites in this chapter proceeds from north to south, organized by major watershed within the study area. For each site, the proposed facilities are briefly described, major issues related to engineering and environmental findings are identified, and a determination is made regarding which options at the site, if any, will be retained for further consideration. The site-by-site results of the preliminary screening are summarized again in Table 5-2, at the end of the chapter.

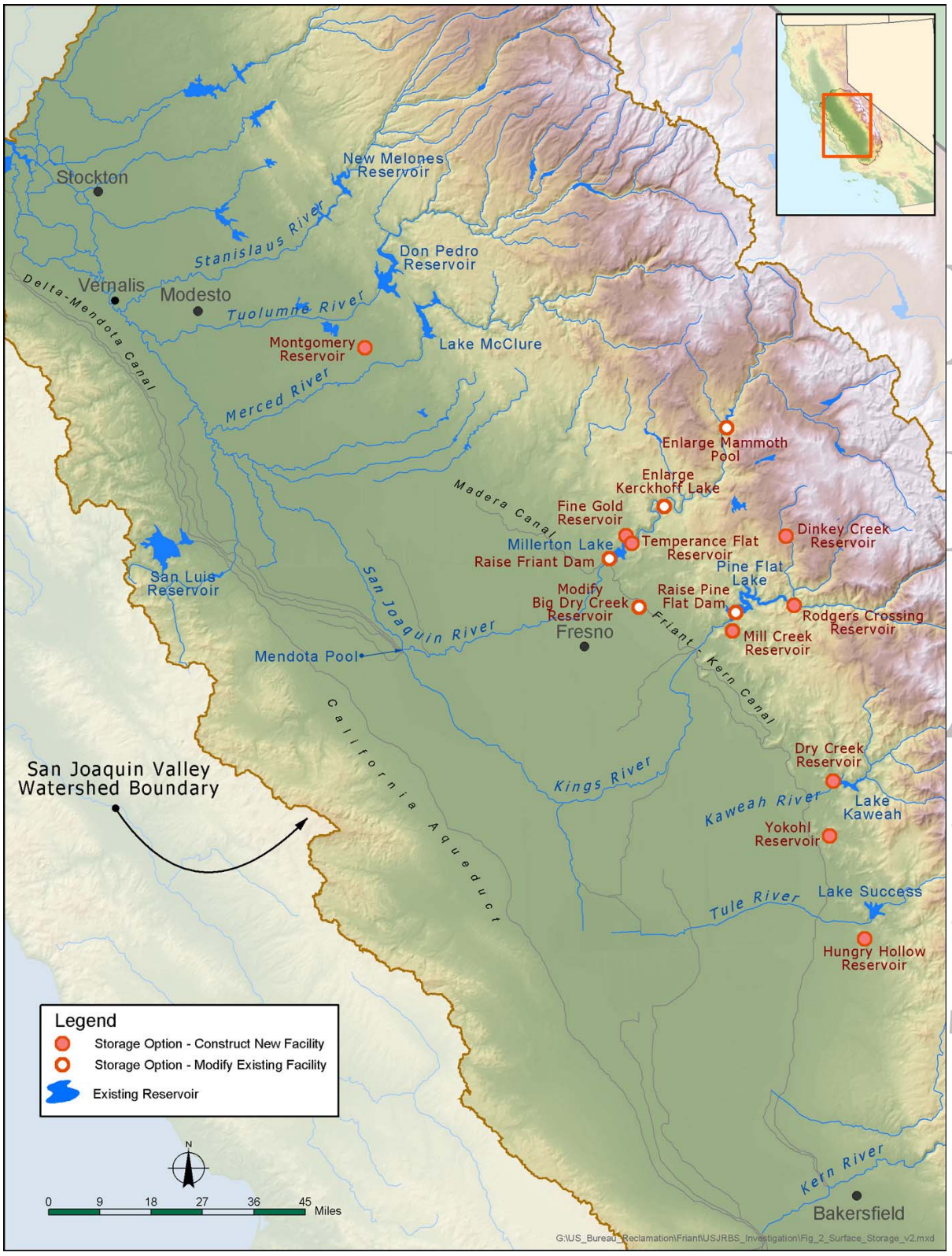

FIGURE 5-1. SURFACE STORAGE OPTION LOCATIONS

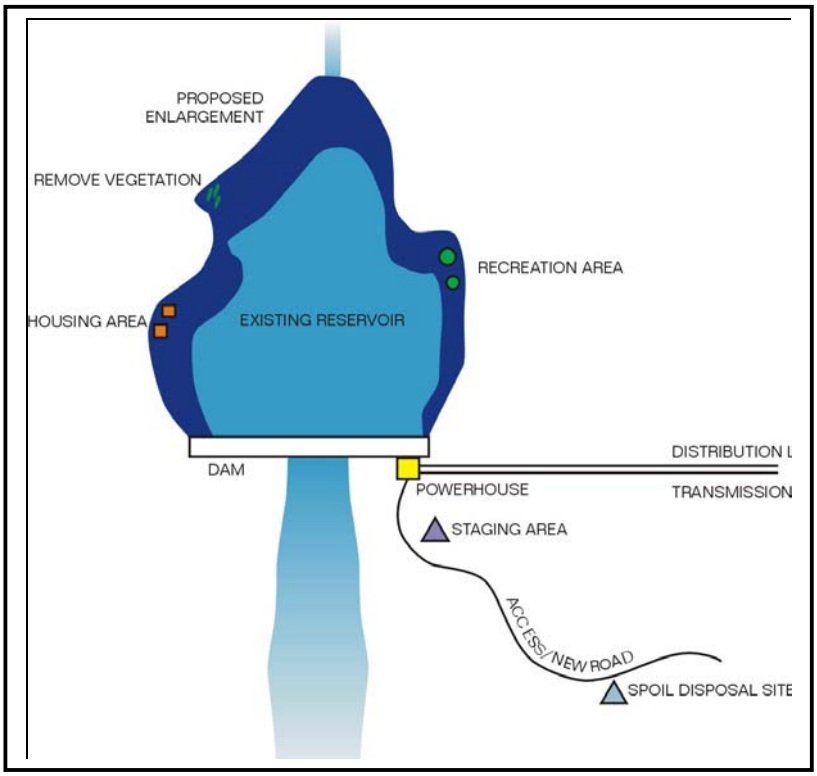

FIGURE 5-2. FEATURES CONSIDERED FOR RESERVOIR ENLARGEMENT

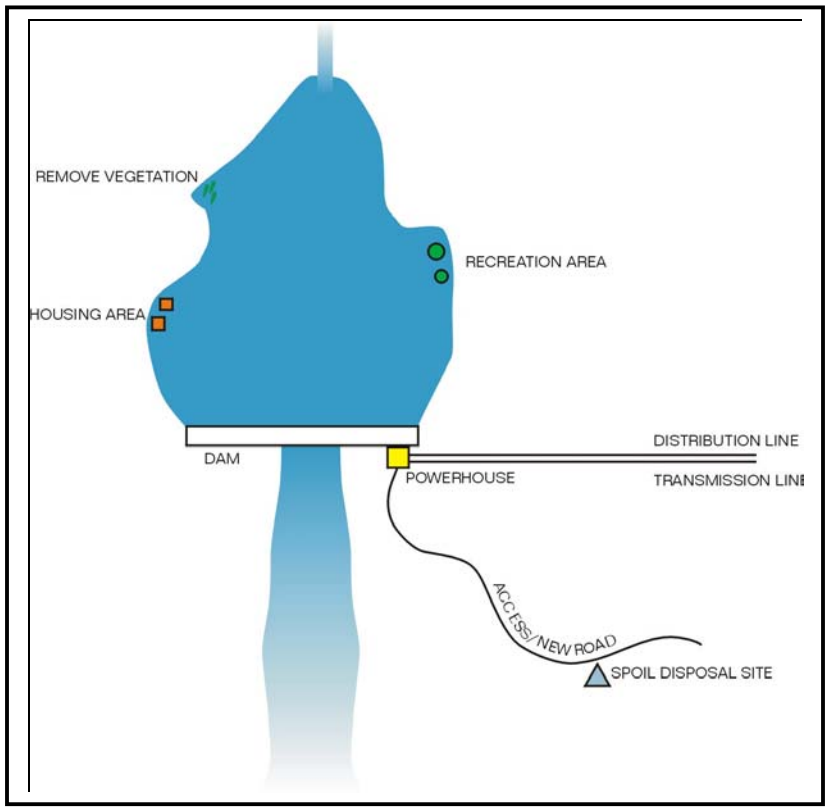

FIGURE 5-3. FEATURES CONSIDERED FOR NEW RESERVOIR

Merced River Watershed - Montgomery Dam and Reservoir

Description of Option

The potential Montgomery Reservoir site is located in Merced County, approximately 3½ miles north of the town of Snelling and 17 miles north of Merced. The reservoir would be created by a dam on Dry Creek, a northern tributary to the Merced River, downstream of New Exchequer Dam and Lake McClure. A zoned earthfill embankment would be constructed, 101 feet in height above the existing streambed. In addition to the main dam, the reservoir would require construction of eight saddle dams, with a combined crest length of 14,300 feet. At a pool elevation of 325 feet above mean sea level (MSL), the reservoir would store up to 241,000 acre-feet of water (see Figure 5-4).

The reservoir would store Merced River water released from Lake McClure, diverted at Merced Falls, and conveyed by gravity via the North Side Canal, an existing gravity distribution canal that serves the portion of the Merced Irrigation District (MID) lying north of the Merced River. Conveyance of water to and from Montgomery Reservoir would require conversion of the North Side Canal from a one-way to a two-way canal and a capacity increase to 2,000 cfs for a length of 30,000 feet.

Surplus flows from the Merced River stored in Montgomery Reservoir would be used to meet local water needs, allowing water stored in Lake McClure to be used for other uses. A pumping plant at the base of the dam and a new pipeline would discharge the water to the North Side Canal. Some of the stored water would flow west by gravity to MID water users served by the downstream portion of the North Side Canal. Additional water could be pumped upstream through the modified North Side Canal to serve MID customers located to the east between Montgomery Reservoir and the Merced Falls Diversion Dam. Water could also be transferred from the North Side Canal to the Main Canal of MID through a connecting pipeline, which would include a siphon beneath the Merced River.

Engineering and Environmental Findings

No major issues were identified regarding the technical feasibility of designing and constructing the required facilities. Most of the land that would be inundated is used for grazing, with sparse rural development. Adverse impacts to wildlife, recreational resources, and existing land uses are expected to be low. Impacts to botanical resources are expected to be more serious, but are likely mitigable. Further study would be required to obtain a reasonable assessment of the expected impacts to aquatic resources and water quality.

MID, the agency that would distribute the stored water under this proposal, has expressed concern regarding the quality of the water that would be developed. With a storage capacity of slightly more than 240 TAF and a reservoir surface area of nearly 8,000 acres, the average reservoir depth would be roughly 30 feet when filled. Concerns about high water temperature, the likelihood of algal growth, and relatively high evaporative losses make the water that would be developed undesirable to MID and its customers. This option will be dropped from further consideration.

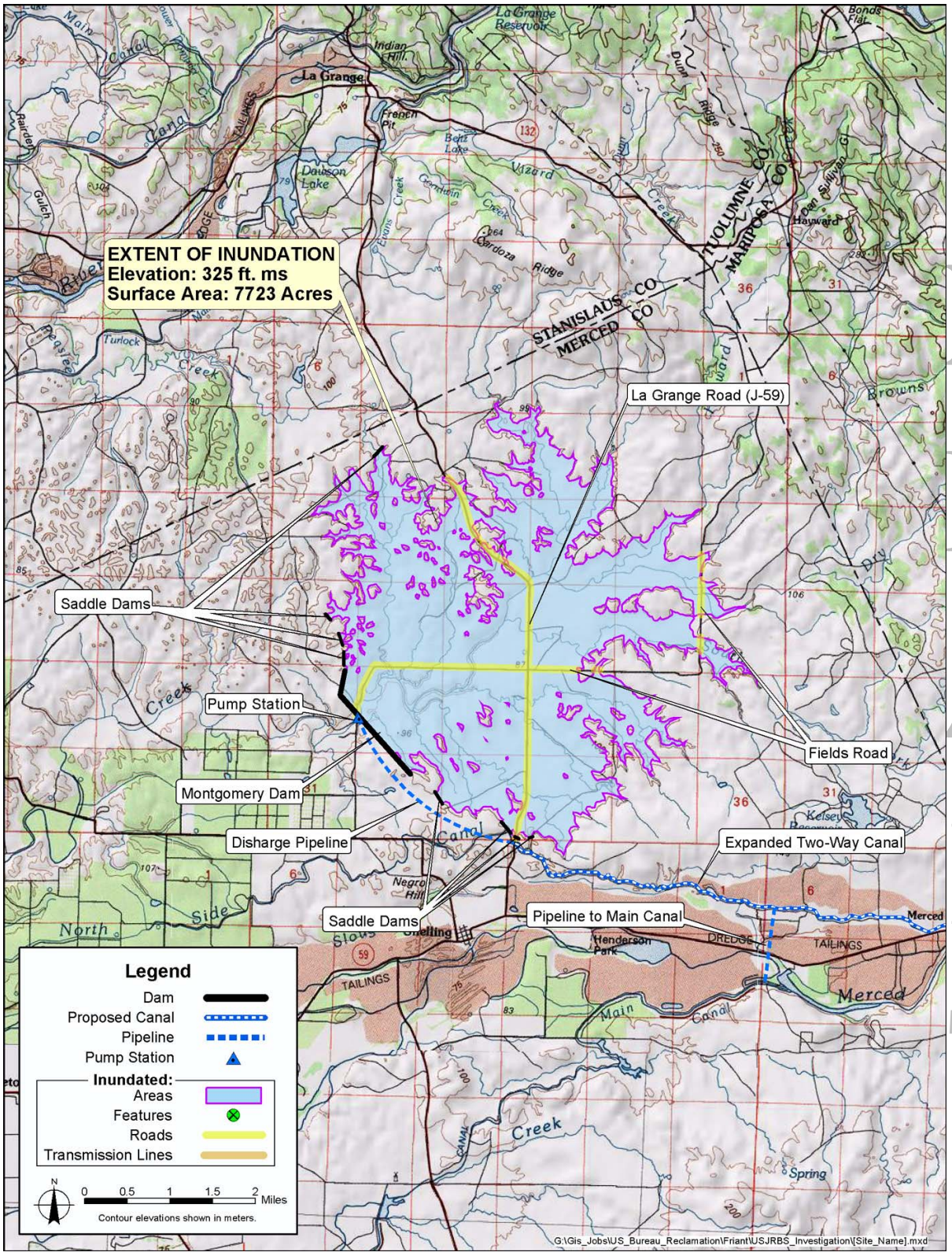

FIGURE 5-4. MONTGOMERY RESERVOIR OPTION

San Joaquin River Watershed – Raise Friant Dam

Description of Options

Friant Dam is a 319-foot high concrete gravity dam on the San Joaquin River about 20-miles northeast of Fresno. Potential modifications previously considered include 25-, 60- or 140-foot raises to increase storage capacity of Millerton Lake. Figure 5-5 illustrates the extent of enlarged Millerton Lake corresponding to the 140-foot raise option.

A 25-foot raise would increase the storage capacity by 132,000 acre-feet. This option would involve raising the dam crest and modifying the spillway and spillway chute. It would also require construction of a dike, approximately 3,000 feet long, across a low ridge saddle at the southwest margin of the existing reservoir. A 60-foot raise, which would increase storage capacity by 340,000 acre-feet, would also entail raising the dam crest and modifying the spillway and spillway chute. Approximately 8,500 feet of new dike would be required for a 60-foot raise. A 140-foot raise, which would result in approximately 870,000 acre-feet of additional storage capacity, would require new dikes of approximately 9,500 feet in total length.

An enlarged Friant Dam and Millerton Lake would continue to capture flow on the San Joaquin River. Additional storage capacity would provide opportunities to store larger flood volumes than the current reservoir. Stored water would continue to be diverted to the Friant-Kern Canal, the Madera Canal, and/or released to the San Joaquin River.

Engineering and Environmental Findings

As proposed, a dam raise would be accomplished with an overlay of roller compacted concrete on the downstream face of the dam. The saddle dam / dike on the southwest rim of the reservoir (i.e. left side, looking downstream) would be constructed with earthfill. For the largest dam raise considered, the dike would be well over 100 feet high in some locations. Safety considerations would be paramount in design of the dike. The availability of materials from local sources does not appear to be a limiting factor.

Millerton Lake Recreation Area facilities, along the left (south) side of the reservoir, include a boat ramp, marina, camping and day use facilities, and other structures. Most private residences near the reservoir lie at or above elevation 610 feet MSL, or greater than 25 feet above the current maximum reservoir level of 578 ft MSL.

American shad (*Alosa sappdissima*), an anadromous Atlantic Ocean fish successfully introduced to Sacramento and San Joaquin rivers and accidentally planted in Millerton Lake in the mid 1950s, is the only known landlocked population of the species. Spawning habitat in the upper portion of Millerton Lake and upstream in the San Joaquin River would be affected due to an enlargement of Millerton Lake. Other impacts to habitat and wildlife would vary relative to the extent of inundation. Any raise of Millerton Lake would affect recreation facilities on the current shoreline. Raise options greater than 25 feet would also affect residential areas and upstream power generating facilities. A 60-foot or 140-foot raise would inundate the abandoned Sullivan mine. Impacts to existing land uses, structures, and facilities appear mitigable, but mitigation would likely require significant cost. This option will be retained for further consideration.

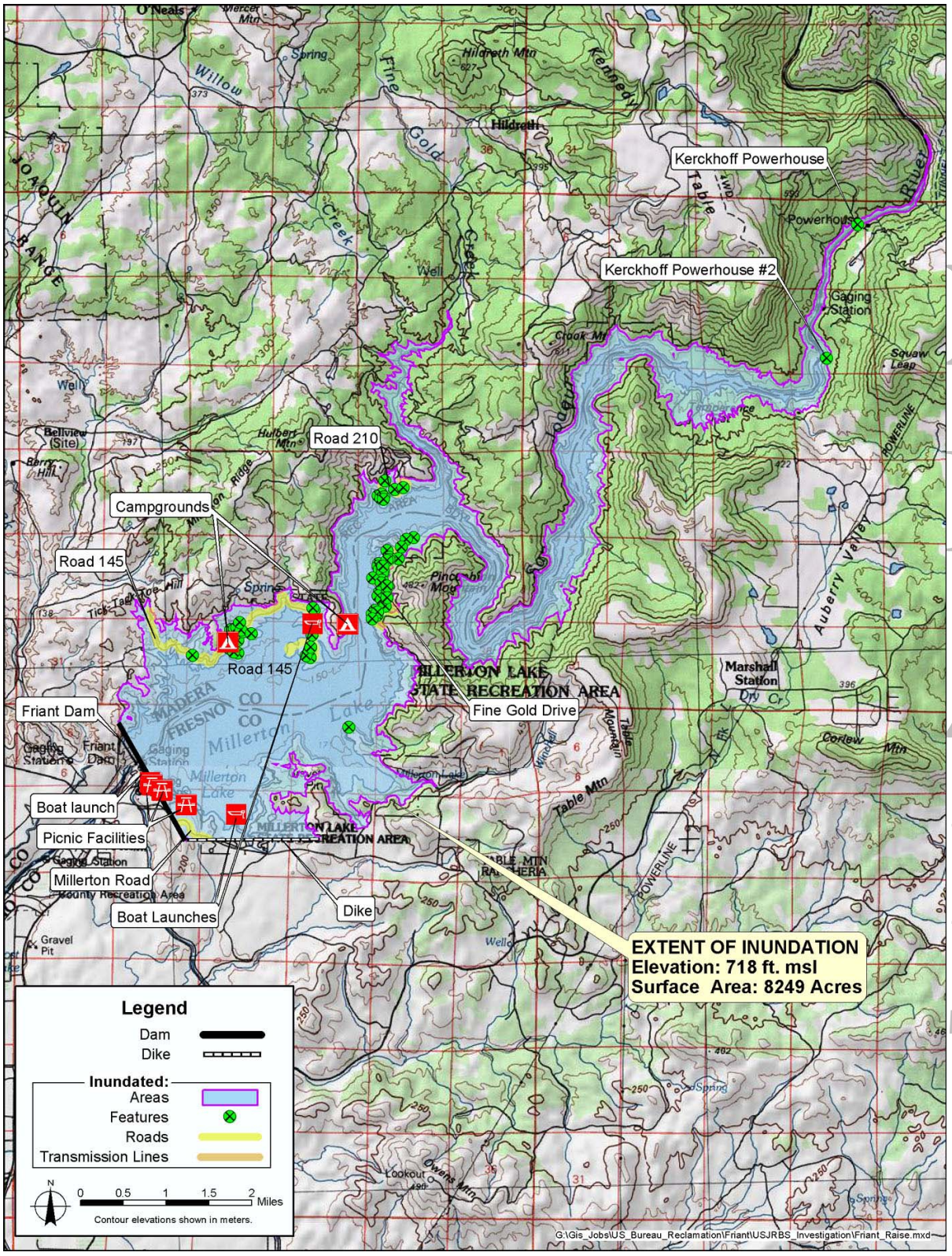

FIGURE 5-5. RAISE FRIANT DAM OPTION

San Joaquin River Watershed - Fine Gold Dam and Reservoir

Description of Options

Fine Gold Creek is a tributary to the San Joaquin River that enters Millerton Lake from the north. The creek drains a watershed area of approximately 91 square miles (see Figure 5-6). Two potential dam heights were considered, 380 feet (dam crest elevation 900 feet) and 580 feet (dam crest elevation 1,100 feet), which correspond to total storage capacity of 132,000 and 780,000 acre-feet, respectively. For each dam size, two potential dam types could be constructed: a roller-compacted concrete gravity structure or a concrete-face rockfill dam. The higher dam option would require construction of a saddle dam on the right (west) rim of the reservoir, approximately 100 feet high and 3,200 feet long.

In all Fine Gold Creek Reservoir options, the primary water source would be the San Joaquin River. The new reservoir would function as a pumped storage facility, with water pumped up from Millerton Lake for later release and recapture of hydroelectric energy. Natural runoff from Fine Gold Creek would supplement the Millerton supply.The stored water would be released to Millerton Lake and then diverted to the Friant-Kern or Madera Canal and/or released to the San Joaquin River. Pumping water from Millerton Lake to Fine Gold Creek Reservoir would provide an opportunity to increase available flood storage space in Millerton Lake, which would then be able to capture a larger portion of flood flows than it does currently.

Engineering and Environmental Findings

Geologic conditions appear suitable for dam construction at this site. Raw materials could be obtained from within the proposed reservoir inundation area. During construction, a temporary coffer dam approximately 80 feet high would be required above the permanent dam site on Fine Gold Creek to divert flows, and a second coffer dam approximately 60 feet high would be required to keep water from Millerton Lake out of the construction zone. One or more diversion tunnel would be required. The number and placement of tunnels depends upon the dam type selected.

Creation of Fine Gold Creek Reservoir would be expected to cause adverse environmental impacts. Extensive pine and oak woodland habitat would be affected, as would pockets of riparian and wetland habitats. Vernal pools and special status species of plants, terrestrial wildlife, and fish may be present in the inundation area. Western pond turtles live in Fine Gold Creek. Abandoned mines and mine tailings in the inundation area create the potential for water quality impacts. Pumped storage operations could affect water temperatures in Millerton Lake and cause fluctuations in water levels in both Millerton Lake and the new Fine Gold Creek reservoir. Lake level fluctuations would affect several species of fish, and could harm the spawning of largemouth bass.

No technical issues were identified that would physically prevent a dam from being constructed on Fine Gold Creek. However, further research would be required to more fully define the extent of resulting environmental impacts and how adverse environmental impacts could be mitigated. This option will be retained for further consideration.